

OBSERVATIONS ON *LITTORINA ANGULIFERA* LAM.
FROM BISCAYNE KEY, FLORIDA

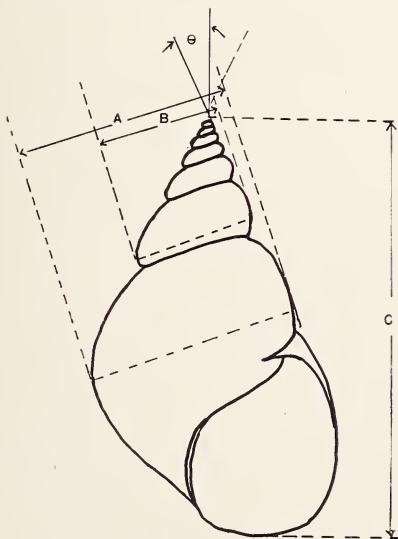
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I.—The Relation of Growth to Sex.

In searching the literature on Mollusca one finds very little indeed on the rate of growth. In the genus *Littorina* work has been done on *L. scabra*, by Sewell (1924), on *L. littorea* by Moore (1935), and on *L. irrorata*, by Newcombe (1936). This paucity of information is more pronounced for forms found in the tropics.

Ecological studies of *Littorina angulifera* were begun February, 1951, under the direction of Hilary B. Moore, University of Miami. This paper is a brief report of one phase of the work completed in May, 1951.

The sex of the snails was determined by the presence or absence of a penis. This is evident only in males of nine millimeters or more in height. Since unequal sex ratios seemed to indicate a varying



Measurements of *Littorina angulifera* Lam.:

- θ —one-half the apical angle
- A—the diameter of the last whorl
- B—the diameter of next to last whorl
- C—height of the shell

rate of development only snails of thirteen millimeters or more were considered in this study.

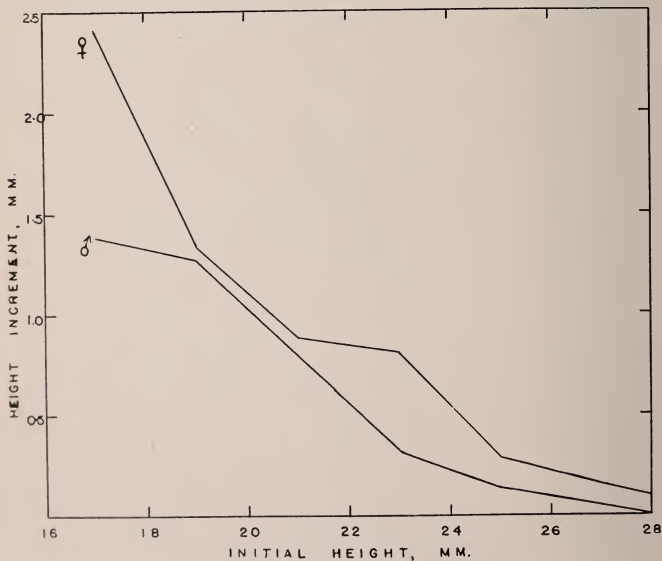
Over five hundred snails from a small area on the north end of Biscayne Key were collected through February and early March. The lip was notched with a rotary file and the snails returned to the same location. Of these, 192 (102 males and 90 females) were found usable in the study when collected on May 23, 1951.

Measurements were made of the height, the diameter of the last two whorls, the apical angle, and the lip increment from the healed notch. The accompanying diagram indicates how these measurements were taken.

The constant for the relationship of the spiral height to length was calculated from the formula:

$$\frac{L}{H} = \frac{\sqrt{1+C^2}}{\cos. \theta}$$

where θ is one half the apical angle,



Graph showing shell increment of the females in comparison with the shell increment of the males in *Littorina angulifera* Lam.

$$c = \frac{2.73 \sin \theta}{\text{LOG. } Q}$$

and Q is the ratio of any two successive measurements 360 degrees apart. In this case the diameters of two successive whorls were used. This constant is necessary to compute the spiral height. By subtracting the lip increment, the original spiral height can be computed and the increase in height then determined.

The results of these computations are plotted on the accompanying graph. Though the sample was small there is a definite indication of a more rapid growth in the female population.

It is interesting to note that Moore (1935) found a similar difference in growth rate for male and female *Littorina littorea*.

SUMMARY

In snails from the north end of Biscayne Key, female *Littorina angulifera* were found to grow faster than males in all adult sizes. The rate slows down above 18 millimeters, increasing again at 22 millimeters to 25 millimeters. The increment is constant from this size to the greatest height.

II.—The Sex Ratio in Adults.

In April and May of 1951 four hundred ninety-one snails of from 16 to 28 millimeters were collected and examined to determine the sex and the ratio of males to females. It was found that 50.6% of the population from 16 to 24 millimeters inclusive were males, while only 26.0% of those from 25 to 28 millimeters inclusive were found to be males. Comparable results were found by Sewell (1924) for *L. scabra*, and Moore (1935) for *L. littorea*.

The fact that the rate of growth is greater in the female would lead one to expect a preponderance of females in the larger size brackets. This is clearly shown to be a fact by the analysis of the adult snails for size and sex. The two studies described above complement each other and strengthen the evidence of greater growth in the females.

SUMMARY

The percentage of males in the population of *L. angulifera* of 16 to 24 millimeters is 50.6%, while the percentage of males in sizes 25 to 28 millimeters is 26.0%.

ACKNOWLEDGMENTS

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